ESAVE

Environmental Stewardship & Value Engineering

Quarterly Newsletter for the National Nuclear Security Administration
Office of Defense Programs

Los Alamos Special Materials workers clean up shop ops

The Los Alamos National Laboratory's (LANL) Special Materials Machine Shop in Building 102 specializes in the fabrication of precision items made from toxic or hazardous materials, as well as from non-hazardous but radioactive materials. A little over three years ago, everything in the Special Materials Shop was considered to be potential radioactive waste by association with depleted uranium (DU). All refuse and excess equipment from

Steven Gonzalez of the Special Materials Machine Shop at Los Alamos National Laboratory operates a machine tool designated for non-radioactive and non-hazardous materials only. Shop workers instituted segregation of machine tools and close monitoring of wastes, everyday operations that boost recycling and pollution prevention.

the shop area was treated as low-level radioactive waste, including desks, chairs, and computers along with materials that had been through the machining process. Machining chips, even those that had no radioactive component, were swept from the shop floor along with chips of DU, and the entire lot was sent to LANL's Radioactive Materials Disposal Site (TA-54).

In 1997, when the Special Materials Shop found itself processing huge amounts of clean copper and other materials whose by-products were worth recycling, the decision was made to segregate the radioactive machines and waste materials. By segregating clean from contaminated chips through improved housekeeping and by hand monitoring the 10-kg bags of collected

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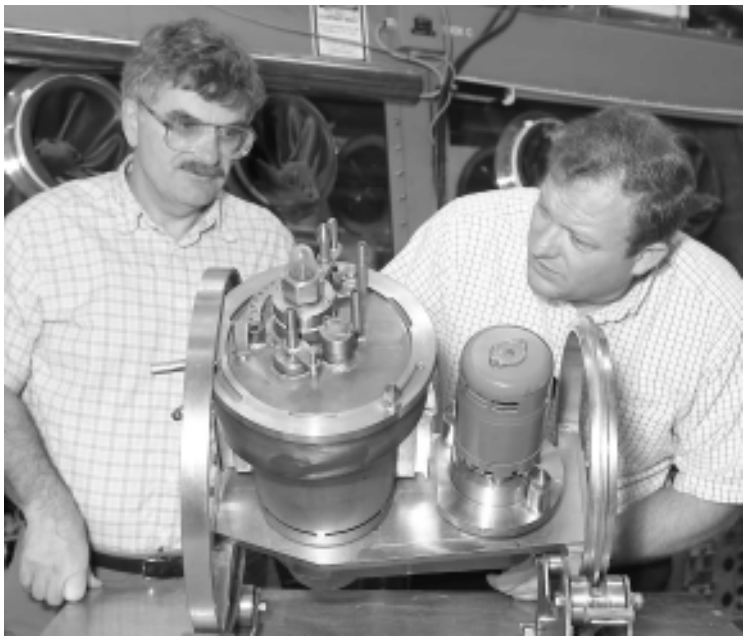
Russian technology aids plutonium processing at LLNL

A former Cold War adversary is providing assistance to U.S. Department of Energy (DOE) efforts at plutonium immobilization.

A plutonium oxide saltwasher was purchased recently from the Russian Scientific Research Institute of Atomic Reactors (RIAR) by Lawrence Livermore National Laboratory (LLNL) as part of U.S.-Russian Joint Plutonium Disposition program activities. The saltwasher, expected to provide a quicker and more efficient solution for preparing U.S. plutonium for immobilization, is to be installed in LLNL's "Superblock" Plutonium Facility. Les Jardine, Russian projects manager for fissile materials in the Fission Energy and Safety Systems Program at LLNL, said obtaining the device was the first transaction of its kind.



Les Jardine (left) and Mark Bronson say some modifications will be made to this Russian-designed-and-built plutonium oxide saltwasher before it is adapted for use in U.S. disposition efforts.

The RIAR-designed and -fabricated, stainless steel/titanium system will fit inside a glovebox and will be used to wash plutonium oxides free of contaminating chloride salts. These salts can hinder the ceramification process used to immobilize excess weapons plutonium so it can eventually be encased in canisters, sealed and stored until disposed of in a repository.

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machine turnings, the shop's generation of low-level waste has been markedly reduced. And thanks to administrative controls and modified procedures, the generation of "suspect" low-level waste has all but vanished. These new methods were designed and developed largely by the shop machinists themselves: Steve Gonzalez, Steve Hidalgo, Bill Hodges, Kim Lloyd, Alex Lopez, Robert Montoya Jr., and David Williams.

The Special Materials Machine Shop team (left to right): Antonio Martinez, Bill Hodges, Steven Gonzales, Alex Lopez, Celestino Vigil, Kim Lloyd, Joni Hyder, Steven Hidalgo and David Williams. Not pictured are Robert Montoya Jr. and Matt Naranjo.

Initially, shop supervisor Hidalgo and radiological control technician Joni Hyder enlisted the help of custodian Celestino Vigil and the machinists to perform a massive cleanup of the entire 9,000 square-foot shop; scrubbing and mopping and removing all non-fixed radioactive contamination. There is no airborne contamination in the shop; so it was possible to completely segregate clean and radioactive operations, even though they might sit side by side. Each machine and its immediate surrounding area were designated non-radioactive, uranium-only, or RCRA-producing. Care has been taken to assure that each machine is used only for the materials specified unless programmatic demands leave no alternative—mixed waste is non-existent.

Machine signage and work logs mounted beside each machine specify the material worked on for any particular project, providing a record and supporting administrative efforts to release clean materials. Initiated by Vigil, specially designated green brooms, dustpans, mops, and mop buckets are used only in "clean" areas. Thirty-five and 55-gallon trash and chip receptacles marked "Green is Clean" make the clean (non-radioactive/non-hazardous) designation possible.

Prior to 1997, salvageable items like typewriters, computers, printers, and tooling plus large non-compactable refuse such as light ballasts and old furniture were sent to the TA-54 disposal site. Now radioactive control technician Hyder monitors these materials for removable contamination, then documents and releases them. She also surveys and documents small non-compactable refuse like wire spools, empty containers, and machining drops. Items surveyed clean go into the "Green is Clean" drums along with other recyclables such as wood, cardboard, steel, copper, brass, and plastic. Hyder surveys floor sweepings and marks the swept-up piles with a green triangle to indicate clean or a yellow triangle to indicate contamination. Along with survey documentation, Hyder maintains a database of all released items.

Quality assurance inspectors Tony Martinez and Matt Naranjo have also reduced the "suspect" waste stream from the shop. One-half to one ream of paper per week, plus other waste materials that were once disposed of as potential low-level waste, are now generally recycled, thanks to the inspectors' meticulous housekeeping in their 1,500 square-foot inspection room. Once the paper leaves the inspection room, Hyder surveys the material with a hand-held detector and labels it recyclable.

Releasing potentially clean chips and turnings has been the shop team's greatest challenge. The old monitoring process involved removing chips from their receptacles, spreading them on a table, and surveying the chips by hand. This process was very time-consuming, not to mention physically demanding. It was also difficult to adequately survey machine turnings because of the hard-to-reach surfaces of long spindly curls of metal.

Only floor sweepings and other recyclable items surveyed as "clean" (non-radioactive/non-hazardous) can be placed in this 55-gallon receptacle in the Special Materials Machine Shop at LANL.

The success rate of this approach in the actual release of chips as clean was around 40 percent, which may not seem that high. But the volumetric detection level for uranium in this process is the equivalent of finding one speck of ground pepper in every 10-kg bag of chips. The release percentage provided the incentive for the shop's next process improvement. A team of experts was formed to evaluate the feasibility of interfacing a monitoring device with a chipper/shredder unit. The team included the shop's Tom Voss, Lynn Gregory, Dino Farfan, and Barry Bryan working with Denny Sultany of the chipper/shredder vendor.

After extensive research, using funds generated by the laboratory's waste generator set-aside fund, LANL purchased the shop a chipper/shredder with a radiological monitoring instrument designed particularly for this project. With its attached conveyor belt and the built-in detector, the equipment is expected to increase the success rate of clean-material release for chips and turnings to 90 percent.

LANL employees in the Special Materials Shop have shown that everyone can contribute to waste minimization and pollution prevention. The strategies and modified procedures conceived and implemented in the Special Materials Shop are consistent with the approaches that were adopted in the adjacent shop, TA-3-SM 39, where "zero coolant waste" has become a routine operating procedure (See *Pollution Prevention Advisor*, Vol. 8, First Quarter 1998, and *ESAVE*, Vol.2, Second Quarter 2000). These successes demonstrate over and again that no one is better than operators at improving their own techniques, especially when they have the support of determined managers.

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Seven LANL organizations honored for pollution prevention efforts

When an organization increases its efficiency, resources are utilized more effectively, which decreases waste and increases profitability, prevents pollution, and improves environmental quality. It's a win-win situation for the organization and the environment—that's the rationale behind Los Alamos National Laboratory's (LANL) participation in the New Mexico Green Zia Environmental Excellence Program—participation that led to seven Green Zia awards for LANL organizations.

The Green Zia program, based on the Malcolm Baldrige National Quality Award, is administered by the New Mexico State Environment Department. The program focuses on the integration of pollution prevention practices and core business management principles to create prevention-based environmental management systems. A voluntary program, Green Zia is designed to help any business organization move from mere regulatory compliance to environmental excellence.

New Mexico Governor Gary Johnson (second from left) congratulates four Green Zia Award recipients at this year's ceremony in Santa Fe. Pictured left to right are James Dalton of LANL's Facilities and Waste Operations, Gov. Johnson, Mike Baker, director of the Environmental Science and Waste Technology Division, Judith Snow of High Explosives Science and Technology, and Patrick Martinez of the Human Resources Division.

New Mexico Governor Gary Johnson presented 30 awards statewide this year, with seven going to LANL organizations. With the 2000 awards (along with three Green Zia awards earned last year), the State continues to acknowledge the laboratory's ongoing efforts to improve environmental quality through operational efficiency and integrated environmental management systems.

At this year's ceremony, Green Zia Achievement Awards—the highest Green Zia Award level presented to date—were presented to 12 different public and private organizations. Of the 12 statewide Achievement Awards, three went to LANL organizations: the Environmental Science and Waste Technology Division (E), the High Explosives Science and Technology Group (DX-2), and Weapon Component Technology Group (NMT-5).

E Division's award was based on the development of systematic processes to continuously improve environmental quality, a dynamic approach to public outreach and information sharing, and the extensive involvement of employees in environmental issues. DX-2 based its award application on the use of Green Zia process evaluation tools, a strong management commitment to environmental safety and the minimization of environmental incidents. NMT-5's award developed from positive operational and financial results including the reduction of material used, the extension of material life, increased recycling and reduced waste, reduced solvent use, and expected savings of $1 million per year through upgrades in cleaning processes, recycling, and increased real-time waste analysis. These three LANL organizations have demonstrated that P2 can be part of their core business practices while contributing to sound economic policies and yielding positive environmental results.

In addition to the Achievement Award, 18 organizations statewide received the Green Zia Commitment Award with four going to LANL organizations: Business Operations Division (BUS), Human Resources Division (HR), Transition Manufacturing and Safety Equipment Project (TMSE), and Facilities and Waste Operations-Diversified Facilities (FWO-DF). These organizations have shown they, too, are committed to improving environmental quality by utilizing Green Zia tools and techniques to implement an integrated approach to environmental management.

"Our ultimate goal is to make pollution prevention a cornerstone of all our business practices and to develop an environmentally conscious culture at LANL that takes us beyond mere compliance," said Tom Starke, program manager for LANL's Environmental Stewardship Office (E-ESO), which coordinates the laboratory's participation in the Green Zia Program. "With seven awards this year, in addition to three awards last year, we confirm our continued commitment to reducing or eliminating waste at every opportunity."

While Green Zia awards are presented only to organizations in New Mexico, the methodology is applicable and available to any business organization. To access the Green Zia Program go to the New Mexico Environment Department's website (http://www.nmenv.state.nm.us/frhome.html), or for an overview of the program, visit the LANL Environmental Stewardship Office website (http://emeso.lanl.gov/index.html).

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Livermore DNT recognizes outstanding performance from B Program workers

In September, Lawrence Livermore National Laboratory's (LLNL) Tom Rambur and Bob Kuklo received awards from the LLNL Defense and Nuclear Technologies (DNT) directorate for their innovative work in high explosives experiments under the Site 300 B Program (see 3rd Quarter 2000 *ESAVE*). In addition to cost savings and environmental benefits, Rambur's and Kuklo's efforts show that DNT's professional and technical staff are integrating ES&H priorities such as pollution prevention and waste minimization in the planning and execution of their work. B Program managers Jack Lowry and Kent Haslam also received awards and are credited by fellow workers for their role in creating an environment where new approaches are encouraged and supported.

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Los Alamos uses its WITS: Waste data at our finger tips

The waste management and environmental compliance group (NMT-7) at the Los Alamos National Laboratory (LANL) is building a computer-based system for tracking inventory, storage, and disposal information for hazardous and radioactive waste and contaminated by-products. Known as the Waste Inventory Tracking System (WITS), the system is designed to provide up-to-date location, status, content information, radioactivity analyses, and other inventory information for every waste item and container managed by NMT-7, providing comprehensive reporting capabilities and cradle-to-grave audit trails.

The WITS will handle numerous waste types, whatever their variation in size, disposal method, and hazard classification, including low-level radioactive (LLW) compactable waste ("room trash"), non-compactable LLW, oversized LLW, mixed waste, hazardous and chemical waste, universal waste, and waste containing asbestos and PCBs. The system will initially be used in LANL's Technical Area 55, which includes the Plutonium Facility, and the Chemical and Metallurgy Research (CMR) Building.

WITS will facilitate handling of waste by NMT-7 staff to help minimize waste disposal costs, ensure compliance with applicable regulations, and standardize waste management methodologies and practices. It is a multi-tiered system consisting of server machines with an Oracle database and web server, personal computers with client software and web browsers, and handheld computing devices with integrated barcode scanners for collecting information in the field.

At the heart of the WITS are barcode labels attached to all waste containers and waste storage locations, which serve as identifiers in the system. The system will include capabilities for tracking placement of waste items into containers, adding new containers to waste storage areas, putting containers inside other containers, moving containers between storage areas, and shipping containers offsite for disposal. WITS will maintain current inventories of each waste storage area, and facilitate reporting to help monitor waste items with regulatory limits for time of storage before disposal.

Handheld computing devices with integrated barcode scanners are used for collecting information on various types of waste in LANL's WITS.

WITS, after an aggressive development and implementation schedule of less than one year, has been in production at LANL since July. Users have been trained in the system, and WITS is now the primary waste management tool for CMR and the Plutonium Facility. As use of the new technology has increased, staff have suggested innovative and alternate uses for the system, including tracking in-use PCB equipment, direct off-site shipments, documents, and other high value items. Other groups within the laboratory, as well as other Department of Energy and government facilities have shown great interest in WITS because of its flexibility and customizability. WITS' development is set to continue as additional modules are added to the system, including inspection of waste areas, document tracking, import/export utilities and administration tools.

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LANL habitat management CD wins pollution prevention award

A team of Los Alamos National Laboratory (LANL) employees compiled three years of research in 30 reports onto a single CD for easy distribution to Department of Energy (DOE) facilities and other Federal agencies. The Reports Compilation Compact Disk Project earned the employees a DOE Pollution Prevention Award in 1999.

The 30 reports contributed to the creation of the laboratory's Threatened and Endangered Species Habitat Management Plan, of which 275 copies were needed. Diana Webb, Carey Bare and Terry Foxx from LANL Ecology (ESH-20) teamed up with Hector Hinojosa, Jim Morgan, Mable Amador and Laura Novak from the lab's Communication Arts and Services (CIC-1) to create a CD compilation of all the reports.

A CD proves easier to handle than 30 background information reports totaling 1,850 pages. In addition, users can easily use the nested menus on the CD and perform custom searches on the reports

The printing cost for each of 275 paper copies would have been $187.50, but the production and cover insert printing cost for each CD was only $37. And because the combined weight of 275 CDs was only 55 pounds, compared to 5,087 pounds for paper copies, shipping costs also were significantly reduced.

In all, the LANL saved more than $40,000 by producing the CDs instead of paper copies. In terms of natural resources, the labratory saved the paper equivalent of 25 trees.

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U.S. Department of Energy Defense Programs' 17th Biannual Pollution Prevention Hands-On Training Technology Workshop

October 31- November 2, 2000 — Portland, Oregon

Leaders show support for putting 'E' into ISMS at Portland workshop

Pure drinking water bubbles from brass fountains throughout Portland, Ore. Visitors from Department of Energy (DOE) Headquarters and DOE facilities across the nation, attending Defense Programs' 17th Biannual Pollution Prevention Hands-On Training Technology Workshop, were delighted by these man-made springs as they explored the historic streets. A perfect symbol of past attitudes toward Oregon's seemingly limitless natural resources, "Benson Bubblers" have been gushing continuously for thirsty citizens on River City street corners since the early 1900s. (The City of Portland recently retrofitted the fountains to conserve water.)

Fresh water from bounteous Bull Run Reservoir flows freely in season from downtown Portland's Benson Bubblers.

Matt Emlen of the city government's Sustainable Portland Commission told the assembly that Willamette Valley settlers were "merely tapping the abundance all around us. But now the challenge is altogether different." Emlen's remarks held a faint but persistent echo of a theme that resonated throughout the first day's plenary sessions: At DOE, it is time to turn from the past and face today's new and formidable responsibilities.

After a warm welcome, workshop organizer John Marchetti reminded DOE participants that the Department is currently placing heavy emphasis on putting in place environmental management systems (EMSs) at DOE facilities. Marchetti noted that the second half of the workshop's first day would be entirely devoted to important discussions of EMS implementation in DOE operations. Kansas City Plant, Waste Isolation Pilot Plant, Savannah River Site, and Brookhaven National Laboratory have already achieved ISO 14001 certification for all or parts of their facilities. With the current importance placed on EMSs, he said, and under the newly established National Nuclear Security Administration (NNSA), "there is change now, and opportunity. But how can we master that change?" This was only the first reminder to the workshop attendees that they are "change" as much as "environmental" managers.

Prolepsis Training's Joe Estey: "Doing what you love to do *to help other people get what* they need*."*

Joe Estey of Prolepsis Training focused his presentation on "getting past 'no'" to bring about the changes needed in DOE today. "The problem is not in getting new ideas into the mind but getting the old ones out," Estey said. He outlined Feinberg and Tarrant's "six steps to project failure" and countered with "three keys to buy-in:" 1) Does it support the business we are in? 2) How does it enrich and integrate with other organizations? 3) What does "success" look like and how do we measure it?

Multnomah Falls

Margaret Nover of Portland's Bureau of Environmental Services: "Nope. Not even close! I'll give you a hint . . ."

Emlen then reviewed Portland's transition to the nation's "greenest" city. The city began working with local farmers in the early 1970s to prevent urban sprawl. In 1994, the City Council adopted "10 Sustainable City Principles" to support a stable, diverse, equitable economy; protect air, water, land, and other natural resources; conserve native vegetation, fish, and wildlife habitat; and minimize human impacts on local and worldwide ecosystems.

Margaret Nover of the City's Bureau of Environmental Services was the clever host of a well-crafted exercise in "P2 Jeopardy," loosely based on the television game show, which was as challenging and informative as it was amusing. Stumped by Nover's questions, many workshop participants may have discovered that they did not know as much about EMS and other categories of environmental stewardship as they thought: A handful of attendees took most of the prizes.

Environmental psychologist Judith Heerwagen: Renovated underground DOE offices were allegedly "better than a government space needed to be."

Debbi Allen, President of River City Resource Group, Inc., shared with the workshop her 10 years' experience in green building in the Portland area. She showed examples of "sun-tempering," materials reuse, debris recycling, and other green design techniques from several current area projects, including the Brewery Blocks, the redevelopment of the five-block former Weinhard Brewery site downtown; the North Campus expansion of Nike World Headquarters; and green low-income housing at the Union Station brownfields, which actually cost less per square foot to build and maintain than "conventional" construction.

Environmental psychologist Dr. Judith Heerwagen, formerly of Pacific Northwest National Laboratories (PNNL) and now in her own consulting and research practice in Seattle, spoke to the assembly about human factors in sustainability. "From a human resources perspective," she said, "we can look at buildings as part of an employee benefit package." Heerwagen offered several examples of value-added through green building, citing a DOE-funded study of the Herman Miller office-furniture manufacturing center in Holland, Mich., designed by William McDonough.

Larry Stirling, DOE/HQ EH: "EMS will be required at every DOE facility by 2005."

After a lunch break, Estey returned to the floor to help the DOE audience identify where is the "E" (environment) in an integrated safety management system (ISMS). Illustrating his point through a series of amusing but enlightening anecdotes from his years as a radiological operator at the DOE Hanford Site, Estey considered the guiding principles of ISMSs. "Real, sustained improvement doesn't come from new programs, policies, procedures, places, or people," he told the workshop, "but from a change in the culture of your organization."

Larry Stirling of DOE Headquarters' Office of Environmental Policy and Assistance reminded the group that Executive Order 13148 calls for DOE to perform a two-year self-assessment using an accepted EMS framework. This agency-wide audit is to be followed by implementation of EMSs at "appropriate" facilities—which he interprets to mean all DOE sites—by 2005, based on the U.S. Code of Environmental Management Principles and/or ISO 14001 standards. Stirling indicated that a facility-level EMS must be integrated into the existing ISMS policy specified in DOE P 450.4, a policy recently reinforced for Defense Programs employees by an August memorandum from Madelyn Creedon, Deputy Administrator for Defense Programs under NNSA. Creedon's memo emphasizes using pollution prevention, energy efficiency, and resource conservation within an ISMS, as Stirling put it, "as a means to achieve and maintain compliance" with environmental regulations and to fulfill the EO 13148 requirement that each agency have in place a process for auditing its facilities for compliance. (*Contact Jane Powers, EH-413, 202-586-7301 or jane.powers@ns.doe.gov and get a copy of EO 13148 from the Federal Register for April 26 at*

Savannah River Site's Dale Bignell: "When analyzing environmental hazards under ISMS, think broadly."

http://www.access.gpo.gov/su_docs/fedreg/a000426c.html, under "Presidential Documents.")

Dale Bignell, Manager of the Environmental Protection Department at Savannah River Site, whose EMS received ISO 14001 certification in 1997, told the workshop that from a practical viewpoint, "EMS and ISMS are conceptually very different. Full incorporation of an EMS in to ISMS would be difficult and probably not possible." Bignell indicated that "DOE's intent is to have no other management system totally independent of ISMS." But Bignell believes that some of the important core components of the two systems are compatible. An EMS and ISMS can function successfully together at the "significant impacts/analyze hazards" level, if implementers "think broadly" in developing categories of potential environmental hazards.

After making individual presentations, workshop speakers Larry Stirling, Dale Bignell, Scott White, Joe Estey, Rich Thorpe, and Deborah Bauer lead a panel discussion on integrating environmental management systems into existing operations at Department of Energy facilities. Questions: "Who is going to pay for it? How do I get it started?"

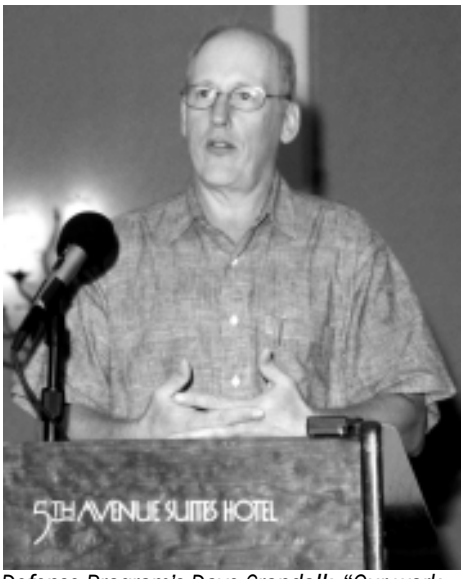
Brookhaven National Laboratory's Deborah Bauer explained how an EMS is integrated into ISMS at her facility. Scott White from the Honeywell Federal Manufacturing & Technologies at the Kansas City Plant detailed how his facility had moved from VPP Star certification in 1996 to ISO 14001 certification in 1997. Representing John Ordaz of DP-10, Rich Thorpe told the workshop, "We need to increase our awareness of EMSs and increase management commitment at Headquarters."

Facing open skepticism from some participants regarding implementing EMSs at DOE sites, Stirling, Bignell, Bauer, White, Thorpe and Estey formed a panel for further discussion. The first day's plenary session ended with a dynamic and inspiring appearance by Howard White, Vice-President of the Jordan Brand for Nike, Inc. and nationally renowned motivational speaker.

Nike Vice-President Howard White: "You have to have the vision and the passion to move mountains."

On the second day of the Portland workshop, working groups visited various area hosts to "learn from the leaders" about environmental stewardship. *(See site visit reports on pages 8-16)*. Working groups made individual presentations of their experiences and findings to the workshop as a whole when it reconvened on the third and final day.

A real high-water mark of the 17th Biannual Workshop came before the group presentations on the workshop's final day, when Dr. David Crandall, Defense Programs Assistant Deputy Administrator for Research, Development and Simulation made a special trip to address the Portland gathering. "I wanted to come to show other people that what you're doing is important," Crandall said. "If there's an environmental problem or an incident at a DP facility, it's DP's job to explain, on behalf of NNSA. Environmental stewardship must become an integral part of our programmatic decision making—it's our job. I want (even) the guy who's running the computer to be motivated by the environment.



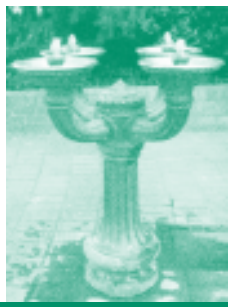
Defense Program's Dave Crandall: "Our work must be done safely, done securely, done with respect for the environment."

"Our work must be done safely, done securely, done with respect for the environment," Crandall said, mentioning Marchetti's longtime, ongoing support of pollution prevention as a model proactive stance. Crandall said that one of the "low points of my life" was when DOE scientists at "some of the labs" told him that "'we don't have anything to do (with safety and environment), it's just more paperwork.'"

Citing Creedon's August memo, the Deputy Administrator told the workshop "I'm going to see that we (top management) are committed to this in our consciousness." As well as assuring compliance through pollution prevention, Crandall said, "we're doing it because we know it's right . . . it's in your soul."

Marchetti closed the workshop with a few passionate remarks. "The past couple of days, we attempted to give you some insight into EMSs. I know what you're thinking—'another program being dictated by those Headquarters folks. We're practicing ISMS, we don't need an EMS!' I beg you, when you get home, ask yourself, ask the folks you work with, where in your facility is there an area that can cause an environmental impact? Do you know where it is? Probably not. And if you knew you had a problem, why haven't you done anything about it?

"One thing all the industries we visited (during the workshop) had in common: They are striving for continual improvement, going beyond compliance, because they understand that being reactive is much more expensive than being proactive. EMS is an ongoing process that will keep an organization compliant and safe."

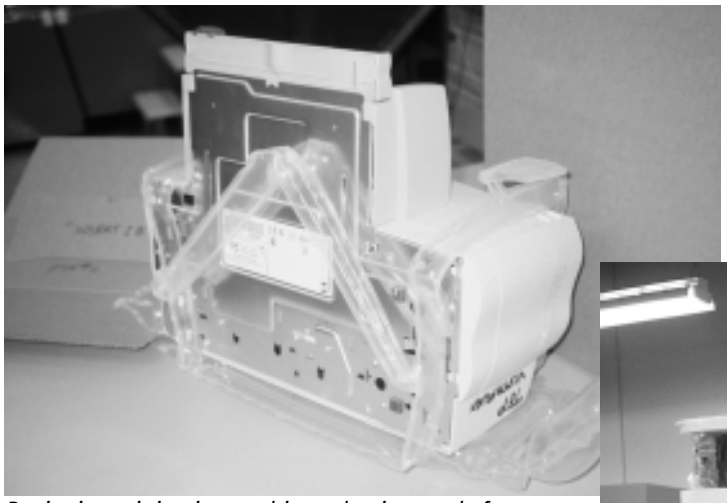


Contact Beth McPherson, MER, Inc., 423-543-5422 or mers@usit.net and go to http://www.dp.doe.gov/dp45/p2/portland/summary/

Hewlett-Packard pioneered DfE, product stewards make it happen

The Hewlett-Packard (HP) Deskjet™ Product R&D facility hosted the Design for Environment (DfE) working group from the 17th Biannual Defense Programs' Workshop in Portland. The DfE group was interested in learning how HP used DfE concepts to meet their commitment to the environment, but the tour had the added bonus of demonstrating how an organization can proactively manage and adapt to change.

HP's stated commitment to the environment is "to provide products and services that are environmentally sound throughout their life cycles; and to conduct business operations worldwide in an environmentally responsible manner." There are four core principles that the corporation depends on to fulfill this commitment: designing products with environmental attributes; improving manufacturing and procurement processes; minimizing product packaging; and enabling regular product reuse and recycling.



Designing minimal, reusable packaging made from recycled and recyclable materials is an integral part of product stewardship at Hewlett-Packard's Deskjet™ R&D facility in Portland.

All of these principles are elements of designing for the environment. HP was an early adopter of DfE, a natural fit to the company's "Design for X" program, pioneered over 20 years ago to address life-cycle problems during the design phase. Now HP's DfE efforts are coordinated through their Product Stewardship program, established in 1992.

Not unlike many Department of Energy (DOE) facilities in the past five years, the Deskjet R&D facility is shifting from a production role to a research role. "Product stewards" within each HP-wide program element administer the company's environmental commitment, and ensure that the core principles are fully integrated into their program element. The HP environmental management system, the DOE group noted, promotes interaction between the Deskjet business entity product steward and product stewards in other global program elements.

The HP product stewards are called upon to anticipate, communicate, and drive the design needs of their business entity based upon worldwide ecological pressure. For example, the steward is on constant alert for new developments or changes to various governmental ecological programs, and assesses their impact on business needs. The steward selects ecological programs with the biggest impact on business, and identifies product-specific challenges. The steward then shares results with each HP business entity or product program team, proves the potential market impact on them, and influences design objectives based on the combined ecological programs identified.

The product steward then leads the organization to meet these objectives, gaining compliance for selected products, providing solid interpretation of ecological criteria, and influencing the decisions of program teams as trade-offs are considered. Then the steward launches worldwide environmental compliance for the product, including suppliers. This compliance with the identified ecological objectives is maintained throughout the product life cycle through end-of-life and take-back.

Working group visitors noted some of the many successes engendered by the product stewardship approach. HP has a very active take-back program and designs for disassembly. Their energy-efficient, two-watt power stage design exceeds Energy Star® and Blue Angel standards. Twenty-five percent of HP's waste stream has been diverted from the landfill into recycling, and hazardous materials have been eliminated from many processes. Reducing product weight is an important logistical success.

The company has also initiated "thin-walling" of its products (to reduce product weight and thus, transportation costs) and incorporated fewer screws, modular design, and single-blend polymers to facilitate their disassembly, reuse, and recycling.

Many of HP's good business practices are transferable to DOE—especially, DOE can learn from HP and other private industry how to manage change. Just as in DOE, there are challenges at HP associated with the sometimes-conflicting priorities of mission and environmental research. At HP, the Product Stewardship program sits within their Customer Assurance organization, separate from their ES&H organization. This helps prevent the corporation's environmental conscience from being a side program, directly linking it with HP's core business. Another major lesson: Using an EMS enhances the effectiveness of product stewardship. The company uses an EMS to track and define their environmental progress. The continued success and support of HP's DfE efforts is largely based on this verifiable, quantitative documentation of their success.

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Nike leaves giant footprint in world-wide sustainability

On a visit to Nike facilities near Portland, the 17th Biannual Defense Programs Workshop's Environmental Teams group discovered a global corporation that takes its local responsibilities seriously. Although there is no production at the Portland facilities, volunteer groups started their own Ecosystems teams, which train workers in pollution prevention as part of Nike's environmental management system.

The surface of this running track at Nike World Campus Headquarters is composed of recycled athletic shoes.

Nike uses an environmental management system called MESH (Management, Environmental, Safety & Health), based on 15 basic elements not unlike the elements of ISO 14001 certification. Ecosystems teams assign responsibility for each MESH goal, identified by scoring the environmental aspects of each part of Nike operations. Nike partners with over 700 factories in 50 countries which must meet MESH standards, and has led 37 of these factories to ISO 14001 certification.

There are three main focus areas for sustainable projects at Nike: product health and safety; catalyzing innovation; and metrics. Product health and safety works from the restricted substance list to provide safe products, ensure worker safety, and prevent environmental damage. Nike partners with companies like Gap and Levi's to demand that vendors meet environmental standards and use no restricted products. Catalyzing innovation involves sustainability driving product design, for example, manufacturing clothes from recycled materials and with less waste. Metrics are designed to measure the successes within the other two focus areas in terms of MESH goals.

The company promotes sustainability in manufacturing new products and through re-engineering its old lines. For example, an older version of polyester in clothes and zippers has been replaced with palactric acid poly, which is made from any starchy food product such as corn or beets. The company is also promoting a switch to organic cotton in Nike products. Nike is working on product take-back, with teams from apparel, footwear, and equipment divisions getting products back from consumers for recycling or reuse.

Nike shoes are recycled into FieldTurf™, an improvement on AstroTurf™, with much more support and the feel of regular grass, and into running tracks, basketball courts, and hardwood floor support. Nike has a grant to work with schools to make the life cycle of an athletic shoe part of their curricula.

Nike is measuring the CO_2 emissions from all air and ocean transport involved in its operations, and is benchmarking fossil fuel consumption by Nike's logistics service providers (LSPs). The 1999 figures: 150 million pounds of CO_2 from aircraft and 279 million pounds from seagoing vessels, is an amount equal to eight years of 6,000 employees commuting. It would require planting 214,976 trees to take this much CO_2 from the atmosphere. The company is holding a two-day conference in 2001 to talk with LSPs about greenhouse gas reduction programs.

Although there is no production at Portland Nike Facilities Ecosystems teams promote pollution prevention programs such as the recycling facility being inspected here by a workshop group.

To reduce CO_2 production by its LSPs, Nike relies on sourcing strategies such as moving its zipper production from Thailand to Taiwan. It has joined with Businesses for Social Responsibility to develop a Clean Cargo Group of greenhouse gas-reducing LSPs. The company also plans to partner with other global companies to further benchmark their CO_2 emissions. The company is forming a global logistics team to meet the requirements of the Kyoto treaty by 2010.

Since the workshop group's visit, Nike joined the group of 50-plus companies that endorse the Coalition for Environmentally Responsible Economies (CERES) Principles, according to December's *Sustainable Business Insider*. CERES endorsers commit to continually improving their beyond-compliance environmental performance. They submit annual reports and regularly engage in dialogue with special interest groups and individuals to improve performance. The endorsement process comes after almost two years of intensive dialogue between Nike's top management and members of the CERES coalition, which include the World Wildlife Fund, Fair Trade Foundation, New York City Comptroller's Office, and the AFL-CIO. "This announcement signifies a tremendous opportunity for environmental and social advocacy organizations to positively engage with one of the highest profile companies in the world on the issue of global responsibility," stated CERES Executive Director Robert Massie.

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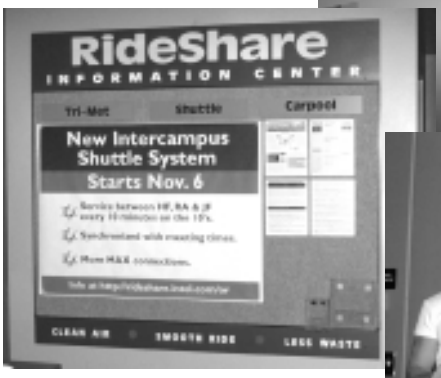
Intel Oregon encourages employees to take the train, bus, share rides

Intel Oregon is the largest of the global silicon-chip manufacturer's world-wide fabrication organizations, with 16,000 employees working at four main campuses and a number of satellite facilities scattered across 50 or so square miles of rich farmland a half-hour west of downtown Portland. Because the roads in this fast-changing rural area have not yet caught up with Intel's explosive expansion—and more importantly, to prevent pollution—the company is trying to drastically reduce the number of single-occupant vehicles (SOVs) coming into its offices and "fabs" (fabrication plants) as well as the attendant traffic snarls. Flexible working hours, compressed work weeks, and shift changes at non-peak travel times at the Intel fabs and offices contribute to less traffic congestion in the West Side area.

Intel Oregon's commuter reduction program is also a product of the State of Oregon's 1998 Employee Commute Option Rule, which mandates that employers like Intel with more than 50 workers at any one site must reduce the number of employees driving SOVs to and from work by 10 percent by 2001. On a visit to the Jones Farm office campus, the 17th Biannual Defense Programs' workshop Transportation Options group learned how the company is rising to this challenge from Intel Oregon's Mark Gorman, who leads the efforts in alternative transportation.



(Clockwise from left) The RideShare kiosk in the cafeteria at Intel Oregon's Jones Farm campus provides information on the company's commute reduction program. Intel Oregon has handed out 30,000 copies of the "RideShare Game" to area children to familiarize them with various transportation alternatives. Intel Oregon's Mark Gorman masterminds regular in-house promotions and competitions to encourage employees to share rides and use mass transit.

Foremost in these efforts is getting Intel employees to ride the TriMet regional transportation authority's east-west light rail line to and from work. Intel partnered with TriMet to construct a light rail station on land donated by the company at the centrally located Hawthorn Farm campus, and issues unlimited TriMet passes to all employees, good for light rail and bus travel anywhere, any time, all year—"a $600 value." Gorman estimated that about 7 percent of Intel Oregon's people currently take advantage of TriMet mass transit to get to their jobs.

"Park and ride" lots at TriMet bus/light rail stations throughout the area facilitate the mass transit commute. Intel Oregon found that the generally north-south TriMet bus schedules were inadequate during peak times for moving people to and from its campuses and leased facilities. So the company partnered with Nike, Portland Community College, and a number of other businesses in the area as the West Side Transportation Alliance to help design the shuttle routes. TriMet added dozens of extra shuttles in the area for three extra hours during both the morning and evening rush periods.

A ride-share database on the company's intranet allows prospective riders or drivers to line up car-mates from their neighborhood and schedule their rides. The database is also the source for ride-share parking permits, and the best parking places are reserved for car-poolers. The database tracks commuting-miles eliminated and even estimates the pounds of air pollution avoided by ride sharing. During the Defense Programs group's tour, the database showed about 800 people on 400 permits were ride-sharing, eliminating 48,456 miles and 1,937 pounds of automotive emissions weekly.

And Intel Oregon, using Federal grant money administered by TriMet, actually buys vans for groups of at least six employees who live a minimum 10 miles from work and want to share the commute. For van-poolers "All they supply is the gas," Gorman told the workshop visitors. There are currently six vans in operation. But, he said, "this is a tough sell to Oregonians," especially those from rural areas and small towns outside the ten-mile limit who are used to relying on their own personal transportation.

Intel Oregon spends about $400,000 a year for special 20-passenger shuttles that run between the four main campuses, mostly ferrying people to meetings. Beginning Nov. 6, the buses began running every 10 minutes between the three closer campuses. Employees made about 2,000 rides per week on these shuttles in 1999, eliminating the numerous auto trips between the facilities.

Gorman also runs a nearly monthly employee awareness crusade to promote ride sharing and mass transit use at Intel Oregon. In the recent "Ride Share Fair," for example, various alternative vehicles, including a human-powered car that requires four passengers for locomotion, were on display in the Jones Farm plant cafeteria. Workers formed teams to compete on the amount of horsepower they could produce (as determined by dynamometer), with the winning team making a tour of the business campuses in the car. The idea behind the competition and the entire Fair was to get employees to think about ways to come to work other than SOVs.

Other promotions include the "Carless October Contest," with weekly drawings of entrants who had forgone automobile commuting, and the "New Year's Commute Resolution Diet," a contest for employees not participating in commuter reduction programs, with food prizes for enrollment. Likewise there was the "Free Lunch" promotion, where workers received a box lunch

and a gift certificate for trying the intercampus shuttle. And Intel Oregon has printed and distributed 30,000 decks of its "Ride Share Game" playing cards, aimed at educating area children in the benefits of car pooling and mass transit.

While the older roads in the West Side area are without bike lanes, as the infrastructure is developed in this high-tech boom town, bicycling becomes more of an option for Intel Oregon employees. Shortly after the workshop group's visit, company fitness center managers set aside five percent of the lockers in their facilities for use by bike owners. Intel Oregon recently received a first-of-its-kind Oregon Department of Environmental Quality grant to design and plan bike storage shelters for the bicycle riders.

These and many other components of Intel Oregon's comprehensive transportation program have led to several awards: the U.S. Environmental Protection Agency 1999 Evergreen Award for environmental excellence and leadership and 1999 "Way to Go" award for achievements in reducing greenhouse gases; the City of Portland's 1997 BEST award for overall environmental success; and a State of Oregon award for having the best commuter reduction program statewide. Intel Oregon was the only company in North America to win the Association for Commuter Transportation 1999 International Outstanding Service Award.

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EPI leads in EMS implementation, ISO 14001 certification

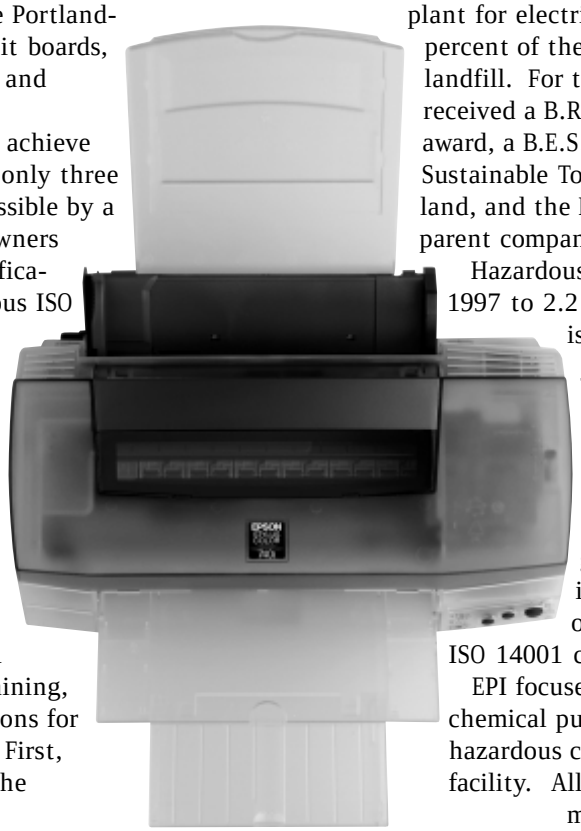
The Environmental Management Systems (EMS) working group from the 17th Biannual Defense Programs Workshop toured Epson Portland, Inc. (EPI), the sole manufacturing affiliate in the United States for Japan's Seiko Epson Corporation. EPI employees not only assemble Epson printers at the Portland-based facility, but they also fabricate circuit boards, create their own plastic injection molding, and manufacture ink cartridges.

EPI was the fourth company in Oregon to achieve ISO 14001 certification, which it gained in only three months in 1998, a speedy process made possible by a top-to-bottom buy-in from the Japanese owners down to the line workers. EPI's short certification process was greatly aided by its previous ISO 9000 certification in 1993.

Putting into practice an EMS for ISO certification not only helped EPI meet its regulatory requirements but also raised community awareness of the company's efforts in environmental stewardship. Plus there are real cost savings—for example, EPI realizes around $300,000 per year in savings from materials reuse and recycling that are part of its EMS.

But there are upfront costs for ISO 14001 certification, including new equipment, training, and employee time. EPI had recommendations for the workshop visitors considering an EMS: First, full management training and support for the process is a must, and it should take place within a sensible timeframe—instead of three months, 12 to 18. And EPI suggested a core group be chosen to implement the system. Tour host George Lundberg told the visitors, "If you keep it simple, if you keep it easy, you will keep it around."

Since its EMS was put in place, EPI has gone from 1,500 tons of solid waste in 1997 to 600 tons in 1999. They are diverting an average 90 percent of their solid waste for reuse and recycling. Excess polystyrene from printer parts goes to a vendor for manufacture of molding and trim. Soft foam packing materials are given to a company for making "bean bag"-type chairs. Food waste from cafeterias is composted to mulch. "It must be excellent mulch," said EMS group member Mike Ellis of the Savannah River Site, "because the grounds are beautiful!" The other 10 percent of waste is incinerated at a local steam plant for electricity generation. As of March, zero percent of the company's waste is being sent to the landfill. For this outstanding achievement, EPI received a B.R.A.G. (Business Recycling Awards Group) award, a B.E.S.T. (Businesses for an Environmentally Sustainable Tomorrow) award from the City of Portland, and the Environmental Grand Prize from its parent company, Seiko Epson Corp.



Epson Portland Incorporated is not only the sole U.S. assembly plant for Epson printers, but also fabricates circuit boards, molds plastics, and manufactures ink cartridges. In 1998, the company achieved ISO 14001 certification in only three months.

Hazardous waste was reduced from 3.8 tons in 1997 to 2.2 tons in 1999, largely through replacing isopropyl alcohol in most operations. A just-in-time/just-enough ordering system was put in place—unneeded products are sent back. EPI's air emissions were reduced from nine tons in 1997 to two tons in 1999. But as Lundberg pointed out to the workshop group, "The biggest thing to note, instead of quoting numbers, is the overall decrease (in pollutants) due to ISO 14001 certification."

EPI focuses on purchasing green products and any chemical purchases must be pre-approved—132 hazardous chemicals are banned from the EPI facility. All fiber packaging used by the company must contain at least 51 percent post-consumer content. The company's environmental goals include zero air emissions by 2001 and zero hazardous waste by 2004. Likewise, 20 percent of its material purchases will be certifiably green products by 2004. And most importantly, EPI pledges to maintain continual leadership in environmental stewardship in the Portland community.

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Implementing sustainability at Norm Thompson—'Escape from the ordinary'

Norm Thompson began in Portland in 1949 as a mail-order catalog for fly-fishing equipment. Over 50 years later, it is the worldwide distribution center for three catalog lines: *Norm Thompson*, *Early Winters*, and *Solutions*, which combined produce and mail 80 million catalogs annually with a 3 percent response rate, which translates to the shipping of 2.5 million packages a year to buyers of advertised products.

The exterior of Portland catalog giant Norm Thompson's headquarters reflects its owners' commitment to sustainability. The stone tiles in the façade were returned materials reused here.

Norm Thompson co-owners John and Jane Emrick attribute their decisions to "go green" to an awareness that they developed on a world tour during a year-long sabbatical in the early 1990s. On witnessing first-hand the state of the planet and its diverse cultures, the Emricks, long-time environmentally and socially concerned citizens, decided that they wanted to somehow "give back" to the world. One challenge was to substantially reduce their business's *negative* impact on the world. The second was to increase their *positive* influence, using the company as a platform to encourage environmentally responsible behavior among suppliers, employees, shippers, and customers.

So in 1993, the Norm Thompson design team began plans for a "green" building to house the company's corporate headquarters. Design, construction, equipping, and furnishing of this innovative and energy-efficient space were the foci of a tour by Defense Programs 17th Biannual Workshop's Implementing Sustainability group, led by Norm Thompson's corporate sustainability manager Derek Smith. But the building is only one aspect of the new environmental consciousness that the Emricks promote and nurture. *ESAVE* readers who would like to know more specifics regarding the green design elements as well as Norm Thompson's overall process to change the corporate culture can go to the workshop website at http://www.dp.doe.gov/dp45/p2/portland/summary/.

The Building

The challenge for Norm Thompson's architects and contractors was to design and construct a building that was to be used for routine activities—testing, designing and advertising products—by 150 employees, but which by fitting the green model would be nonetheless an "escape from the ordinary." The workshop group identified some of the design elements through which they achieved this objective.

The site and building were retained and developed through a 10-year lease. The bonus, at least to the Emricks, was that the property included the adjacent wetland at no extra charge. The sounds and beauty of this wild space, accessible through the headquarters building's operable windows, an open patio, and balcony, reinforced the reasons for designing sustainably. A rock-lined "bioswale" planted with special grasses which absorb toxins carries rainwater runoff from the parking lot into the wetland. Native plant species were used in landscaping and are watered, the few times it is necessary, via water-conserving, drip irrigation.

On the inside, the stone-tiled wall has the cool and substantial presence of a mountain waterfall. Salvaged hardwood reflects natural daylight warmly into the room.

Energy-saving options increased the overall building cost by $4 a square foot, but save an estimated 35 percent in utility costs annually. Whereas the payback period for these was originally estimated to be around eight years, it was in fact four; the fifth year of occupancy has seen all of those savings turned into profit. Innovative lighting, heating, and air circulation and conditioning systems all contribute to the lower utility bills.

As a first step to saving energy, site planners oriented the building on the site to take full advantage of natural light from a southern exposure. Throughout the building, daylighting is enhanced through the use of multiple windows adorned with light shelves inside and out. The dark colored shelves on the outside of the building shade the gas-filled, double-paned, low e-coated windows from solar gain during the hotter parts of the year; the inside, light-colored shades, aided by a somewhat reflective ceiling and lower-than-average partition walls, bounce light into the interior of the building. Computerized electric lighting systems automatically brighten or dim lights according to the level of available daylight, and computerized light sweeps turn off unnecessary lighting when rooms aren't being used and in the evenings at a pre-programmed time.

The building has no furnace and is sustainably heated, when necessary, by heat retention coils that capture the heat released by humans and equipment, and then transfer it to fresh, incoming air. Cooling the interior space is simply the reverse of this process—heat is captured and transferred to air that is exhausted. Both

methods work except during rare cases of extremely hot or extremely cold weather, when electric resistance coils in the ducts or traditional air conditioning may be called into temporary play.

Curved and canted, fluid-green walls and indirect lighting amplify the theme of the Norm Thompson headquarters building: "A River Runs Through It."

Innovative use of color, form, material and other elements of design demonstrate the theme of the building—"A River Runs Through It." Smith pointed out numerous examples of how these elements interplay as the group stood in the lobby and discussed the use of alternative materials at every level of construction. Visitors enter this bright, two-story space through a stone-tiled foyer and continuing wall that has the cool and substantial presence of a mountain waterfall. The floor of the main reception area is laid with a now-endangered hardwood species, Philippine Apitong, salvaged from decommissioned boxcars. The golden wood reflects natural daylight warmly into the room from floor to ceiling glass panels, rectangular niches in the "stone wall," and large paned clerestory windows. The forest-green hue of the interior walls is the natural result of a patented recipe for the 1/8-inch, maintenance-free, wall and floor covering composed of recycled windshield glass and cement.

Furniture in the lobby as well as the paneling, railing and interior doors were locally designed and constructed from certified sustainable forest products. The lobby desk and cabinet doors are a laminate of wood shavings and tables made with a base of formaldehyde-free particleboard. Upholstery fabrics were purchased from companies who have robust environmental policies; bidders on all procurement opportunities were made aware that the chosen suppliers would be environmentally responsible and, if possible, locally based. The carpet, laid with a water-based adhesive, is recyclable by the manufacturer.

If the invigorating but comfortable entrance has the intended "lodge-like" feel, then the rest of the building continues one's sense of exploring the Pacific Northwest. Curved and canted, fluid-green walls widen and narrow much like a gorge or river would. Display cases along the way honor indigenous peoples and mounted plaques name companies that have partnered with Norm Thompson in efforts to achieve sustainability. The lighting and HVAC strategies discussed above are applied throughout these passages as well as upstairs where the actual work areas are located. All paints are low-VOC content, and the primer was a leftover discovered in a warehouse.

Norm Thompson employees compost, recycle, tend the organic garden east of the patio, and win monthly awards for suggesting ways to improve business practices. The janitorial staff, for instance, voluntarily turns the compost and gets credit for recommending biodegradable cleaning supplies. When new sustainable initiatives are launched, no one says "no."

Lessons Learned

Smith explained to the group that Norm Thompson strives to be transparent in narrating the story of how this building came to be. There were mistakes, and the company wants people to know what they were so that they can be avoided in the future. The lobby's stone tile, for instance, had been returned by a contractor and was being warehoused by the supplier. Believing the material to be locally cut and sold, Norm Thompson hoped to salvage and utilize it as part of its green building. As it was, the tile was not dimensioned exactly, and therefore required an exorbitant amount of energy and labor to incorporate into the building.

17th Biannual Defense Programs Workshop's Implementing Sustainability group at Norm Thompson: (left to right) Byron Kitt, Alicia Hale, host Derek Smith, Karin King, Glenn Thornton, Ralph Smith and Beth McPherson.

Also, light bounce inside the building is not as effective as it should have been. The high ceiling is not flat and white and the corrugation on the underside of the metal roof baffles rather than floods the light that it receives from windows and the fluorescent fixtures pointed up at it. Not all of the partition walls are as low as they should be, so again much of the light that could have poured into the center of the building does not.

Most importantly, employees were not educated beforehand in the use of a green building and the reasoning behind some of the unfamiliar design features. More than anything, this is what Norm Thompson wishes they had orchestrated differently. As Smith said more than once, "I think of our jobs more as 'change management' rather than as environmental management." This is a case where we see that employees are key, and education is first and foremost in getting people to accept change.

Despite the missed opportunities, Norm Thompson is receiving accolades for the new building and is happy to be influencing others to follow suit. Their goal to integrate holistically everything they do involves products, packaging, printing, transportation, and influence. These internally identified areas of impact will receive a great deal of attention over the next five years as their plan for sustainability unfurls and flies high.

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'Earth Smart' Portland nurtures sustainable construction techniques

Team leader Debbi Allen, President of River City Resource Group, guided the members of the Sustainable Construction working group from the 17th Biannual Defense Programs Workshop to Nike World Campus Headquarters, the newly renovated Portland City Hall, and the urban redevelopment project known as the Brewery Blocks.

Allen has served as advisor/coordinator for these sites' environmental goals, ensuring that "green building" practices are incorporated into the projects, such as techniques identified by Portland General Electric's (PGE) Earth Smart® Program. To be Earth Smart-certified, projects must meet or exceed various criteria in energy efficiency, environmental responsibility, quality indoor environment, and resource efficiency.

A 7-acre lake at Nike World Campus Headquarters not only reflects the beauty of the sustainably built buildings, but also serves as a retention basin for storm water runoff.

Nike World Campus Headquarters

Nike's Monty Moore escorted the workshop group around the "green-built" 75-acre Nike World Campus Headquarters, where the overall energy efficiency betters Oregon Energy Code requirements by 23 percent. Nike's efforts toward sustainable construction began with concerns for the land itself. Mature trees were preserved wherever possible (and many more planted later), land contours were minimally modified, and wetlands were mitigated to exceed regulatory compliance. A central 7-acre artificial lake accumulates excess runoff from natural drainage areas after heavy rainfall events.

"Green" material usage within the 16 major structures at Nike includes maximum fly ash content in concrete, recycled content tiling and drywall, water-based stains and finishes, low-VOC paint, and low-volume faucets and toilets. An estimated 80 percent of materials and construction contracting/design/labor was purchased within 500 miles of the complex and 500 tons of construction debris was recycled.

Maximum daylight enters all the structures through energy-efficient glazed skylights and window walls; electrical lighting (primarily indirect, using light painted surfaces for maximum reflection) synergistically interacts with the daylight via sensor-controlled, continuously-dimming ballasts. Overall lighting usage is a low 0.95 watts per square foot.

Beyond technical measurement is the sheer beauty of the Nike campus. The buildings seem to grow out of the overall landscape, with natural stonework bridging the gap between steel and grass. Walking trails, a running track, soccer fields, streams, and the central lake lend a feeling of expansiveness; yet the buildings, especially the individual working environments, convey intimacy. The Nike World Campus Headquarters instructs that even cutting-edge construction projects funded from deep pockets can benefit from reductions in energy costs through sustainable construction practices.

Portland's 1895 City Hall Building was renovated in 1998 according to Earth Smart and Green Building principles, but maintains its vintage look inside and out.

Portland City Hall

Portland followed its own Green Building Initiative and PGE's Earth Smart guidelines during its 1998 City Hall renovation. Rather than merely "repair" the sadly dilapidated structure, built in 1895, a careful restoration was undertaken, with the result of a functionally improved modernization preserving the structure's historic look and feel. An example: Workers carefully removed, numbered, refurbished, and relaid the thousands of original marble tiles throughout the building.

Compliance with Portland General Electric's Earth Smart® quality control guidelines not only gains the builder various tax credits over a five-year period, but also achieves significant energy savings during a structure's life span. To be Earth Smart-certified, projects must meet or exceed various criteria in energy efficiency, environmental responsibility, quality indoor environment, and resource efficiency. Some of the category component measurements are formulated using DOE-2 energy-modeling software. Complementing this effort, Portland's Sustainable Portland Commission has implemented its Green Building Initiative, which establishes high-performance and ecological standards for all City-run building projects, taking into account the total impact of a building on the environment.

A partial list of energy-efficient and ergonomic improvements at City Hall includes:

Two skylights covered since the 1930s were reopened to flood the interior of Portland's City Hall building with natural daylight.

- almost 90 percent of construction debris recycled
- energy-saving, double-glazed windows added
- carpet made from recycled pop bottles
- wall/ceiling insulation with 30 percent recycled content
- new compact fluorescent lighting fixtures crafted to resemble the originals
- two atrium skylights closed off in the '30s were reopened for natural light
- original decorative trim, wood paneling, window casings, brass and copper stair railings, blazed brick and marble pillars salvaged and restored
- efficient air filters; fresh-air intakes placed away from pollutant sources
- low-toxicity paint and flooring finishes used exclusively

The expanded atria inside, running from ground floor to ceiling, lend an air of spaciousness without removing any usable working areas. Mayor Vera Katz summed up the endeavor, saying, "We're proud of this renovation to preserve the historic character of City Hall and modernize its operating systems. Once again, Portland is setting a standard of livability and environmental sustainability for the region."

In the redevelopment of the Brewery Blocks near downtown Portland, parts of the original structures will be incorporated into an energy efficient complex of retail space, offices, and housing.

Over 90 percent of demolition debris was recycled in this five-block redevelopment project built around the site of an old brewery in Portland's Pearl District.

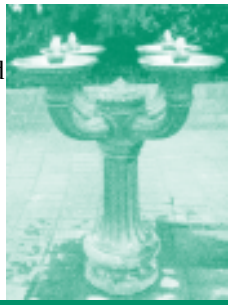
Brewery Blocks

Located at the site of the former Blitz-Weinhard Brewery, Brewery Blocks is a five-block construction project in Portland's Pearl District near downtown that will include 1.7 million square feet of urban retail, Class A office space, and residential housing with parking. Environmentally friendly building techniques are being used extensively throughout the project.

During demolition for the Brewery Blocks, recycling of debris reached 90 percent, while some of the old building facades remain as shells for new structures; two of the buildings, the Weinhard Brewhouse and the Armory Building, will be historically preserved. At least 70 percent of materials and labor will be procured from within 500 miles of the project, 70 percent of new materials will be certified recycled content, and 90 percent of new construction debris will be recycled. Most buildings will share air conditioning from a district chiller. Some of the sustainable building techniques in the Brewery Blocks redevelopment include:

- energy use modeling by PGE, using DOE-2 software
- extensive daylighting with high-efficiency window glazing
- sensor-controlled variable, high-efficiency lighting
- highly filtered indoor air, with the option of operable windows
- low VOC paints, varnishes, and adhesives
- Earth Smart-compliant leasing
- use of wood from sustainable forests where possible
- Interface™ carpet (modular leasing system)
- stormwater retention for reuse
- induction lighting and variable speed CO_2 sensors in underground parking garage

Besides being Earth Smart, the Brewery Blocks project has also received guidance and incentives from the Oregon Office of Energy's Business Energy Tax Credit Program, the Oregon Climate Trust, and the U.S. Green Building Council's rating program for systems and resources, Leadership in Energy and Environmental Design.



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Energy Efficiency Group discovers why Portland is 'The City that Works!'

The 17th Biannual Defense Programs Workshop Energy Efficiency Group learned firsthand the secrets to success of the City of Portland's energy efficiency. Escorted by Curt Nichols, Senior Energy Program Manager for the City's Energy Division, the group saw how energy efficiency reduces the City's dependence on natural resources and cuts down on the production of air, water, and land pollutants while saving money.

State and local programs have historically worked together to preserve Oregon's natural bounty and are the foundation of Portland's energy efficiency success. In the early 1970s, Oregonians were beginning to see the importance of protecting and managing their natural resources. In the words of then-Gov. Tom McCall, "Heroes are not giant statues framed against a red sky. They are people who say, 'This is my community and it's my responsibility to make it better.'" Gov. McCall opened the eyes of many Oregonians to the need for proactive environmental programs, one of which was energy efficiency.

In Portland's City Hall, compact fluorescent lighting matching the building's turn-of-the-century fixtures helps save electrical energy.

Portland established the City's Energy Division partly in response to the 1973 oil shortage and the subsequent increase in the cost of electrical power. The Energy Division grew in responsibility, until, in 1991, Portland City Council initiated the City Energy Challenge to save 10 percent of the City's energy bill by the year 2000. Within seven years the initiative saved in excess of $5 million. By 1997-98 the annual savings had climbed to $1.3 million. These savings came as the result of completing 70-plus projects involving energy retrofits to buildings, new and efficient designs for new construction and remodeling, and electricity rate reductions. Some of the Energy Division's successes under the Energy Challenge program include:

Portland City Hall's renovation included extra insulation, energy saving windows, and two interior atrium skylights to reduce the dependency on electric lights. The original light fixtures in the building were upgraded to use compact fluorescent lights. The estimated savings of energy use is $15,041 per year or 24 percent the total annual electrical usage.

In the Multnomah Arts Center, a leaky steam boiler system replaced with water-loop heat pumps, resulted in a savings of 30 percent of their annual energy use or $13,692.

Downtown Fire Station No. 1 accommodates administrative offices, active-duty fire fighters, and an underground parking facility. As a 24-hour complex, the savings from use of the occupancy sensors and lamp/ballast retrofits saved $8,100 annually.

The 1900 Building reflects the critical role the City's Development Services Bureau plays in maintaining and enhancing Portland's long-term livability. Flexible, open-office environments utilizing a raised-floor air-distribution system allow individual employees to control comfort at their workspace. City management believes that providing a comfortable, clean, and well-lighted work environment promotes employee productivity and enhances energy efficiency.

The Columbia Boulevard Wastewater Treatment Plant (CBWTP) tested and installed new diffusers to speed up the process whereby microorganisms metabolize organic pollutants. The result cut the amount of air and energy needed by one-half and improved the process. The plant now saves $352,584 annually on its electrical consumption.

The treatment plant is also home to the City's first fuel cell. Early on in the development/implementation of the fuel cell, a study indicated that methane produced by a landfill would peak and drop off as organic decomposition dropped below dependable levels, thus making landfill gas an unreliable source of methane. On the other hand, production of methane at the wastewater treatment plant is a natural by-product and remains steady. This dependable recyclable resource was the basis for selection of the treatment plant for the fuel cell installation.

The CBWTP fuel cell utilizes 5 percent of the wastewater treatment plant's methane gas to produce approximately one-third (200 kilowatts) of the power needed to operate the plant. The fuel cell operates at a peak of 220 kilowatts and as emissions produces only a small column of ultrapure steam and heat—no CO_2. The fuel cell has been in operation since July 1999 and has provided estimated savings of $100,000 in its first year.

Tim Hall and Duane Sanger of the City of Portland's Environmental Services Bureau are proud of this fuel cell, which generates "green power" from methane, a by-product of a municipal wastewater treatment plant.

However, the fuel cell cost more than $800,000, with actual cost including installation exceeding $1.3 million. It must run without fail for a period of 14 years to pay for itself. But Portland expects the cost of this technology to come down in the coming years and is considering purchasing additional fuel cells for placement at the CBWTP. The City is also looking into the cost benefit of micro-turbines versus fuel cells. Micro-turbines generate a small percentage of CO_2, but are more efficient in power output than fuel cells and cost less. They are also more easily installed and are more flexible in their application.

The City of Portland's motto is "The City that Works." As casual observers, the workshop group saw many things that made them believe Portland is headed in the right direction—toward sustainability through energy efficiency.

Contact Curt Nichols, City of Portland Energy Office, 503-823-7418 or curt@ci.portland.or.us

2001 gas mileage info is online

The latest edition of the Fuel Economy Guide was posted online to kick off the annual observance of October as Energy Awareness Month at U.S. Department of Energy (DOE) Headquarters. The guide, a joint effort between DOE and the U.S. Environmental Protection Agency (EPA), ranks the fuel efficiency of vehicles in various class sizes. The guide rates advanced hybrid technology vehicles best in fuel efficiency.

Estimates rank the Honda Insight as the most fuel efficient car at 61 mpg during city driving and 68 mpg on the highway. The Toyota Prius, at 52 mpg in the city and 45 mpg on the highway, ranked second. Both are hybrid electric vehicles, using the combination of a small gasoline engine and a self-chasing motor/generator. Top-rated vehicles in various categories included the Ford Focus station wagon, Mazda 626 sedan, the Oldsmobile Silhouette, Chevrolet Venture, and Pontiac Montana minivan; among SUVs, the Toyota RAV4 was rated the most fuel efficient in its class; among pickups, the Chevrolet S-10, GMC Sonoma, and the Isuzu Hombre were the top-rated pickup trucks.

Go to http://www.fueleconomy.gov/

SECA boosts fuel cell development

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) and Pacific Northwest National Laboratory (PNNL) joined forces recently to launch a new fuel cell-focused program called the Solid State Energy Conversion Alliance (SECA).

SECA participants—government agencies, national laboratories, universities, and commercial developers—will combine expertise and resources in support of a common goal to bring a clean, affordable and highly efficient solid oxide fuel cell to market within 10 years.

"We envision a fuel cell system that not only meets the diverse power needs of many different markets, but one that runs on abundant fossil fuels, such as natural gas, gasoline and military fuels," said Subhash Singhal, one of the researchers involved in fuel cell development at at PNNL.

Sponsors of SECA believe they can drive down the cost of fuel cells through the mass production of a versatile 3-10 kilowatt-size fuel cell module. Mark Williams, NETL fuel cells product manager, said making fuel cells cost effective is critical to their acceptance by industry. "Through SECA, our goal is a solid-state fuel cell system that costs less than $400/kilowatt (kW) for stationary applications and even less for transportation applications."

Another goal is a high fuel-to-energy conversion efficiency, which will result in significantly reduced carbon dioxide emissions and negligible emissions of other pollutants.

Near future applications include auxiliary power to operate heaters, air conditioners and other accessories in autos and semi trucks and complex electronics on military equipment. Mass-produced modules can be combined like batteries for applications with large power needs. DOE funding for SECA is projected to be approximately $350 million over the next 10 years.

Contact Gary McVay, PNNL, 509-372-3762

Ultra-clean fuels goal of task force

As part of an administrative effort to cut air pollution from automobiles, trucks, and buses by more than 90 percent, the U.S. Department of Energy (DOE) has selected eight research teams to help pioneer a new generation of ultra-clean transportation fuels and tailpipe emission controls.

Ultra-Clean Transportation Fuels Initiative project teams will examine the feasibility of using natural gas rather than crude oil as the starting point for making low-polluting fuels. Other groups will study new refining processes that remove sulfur pollutants from crude as well as look into converting coal and coke into clean fuels. Yet another project will look into a new type of emission control system that uses a chemical process to capture nitrogen oxides from exhaust.

The Federal and industrial sponsors will share costs of the projects, valued at more than $176 million. The Office of Fossil Energy is leading the fuels development effort and the Office of Energy Efficiency and Renewable Energy is responsible for the vehicle system emission control projects. The U.S. Army also is part of the initiative, providing a portion of funding for the new projects in return for project data for military vehicles.

Go to http://www.fe.doe.gov/

From 'Russian technology' on page 1

In the past, LLNL has relied on a more conventional system—a series of beakers and flasks used within a glovebox—to wash, filter and dry plutonium. The plutonium oxide saltwasher accomplishes all three tasks in less time and with less radiation exposure. While chloride salts are removed, other contaminants are deliberately left behind, making the plutonium less attractive for proliferation. Also, "It's an automated system, which means it will be faster and more efficient than our own current methods," noted Mark Bronson, associate program leader for plutonium processing.

Bronson and Jardine discovered the machine while touring a RIAR plutonium facility in Dimitrograd last year. "It caught my eye," Bronson said. "They weren't trying to push this machine. But when I said it was something we may be able to put to use, there was interest in working up a contract."

Livermore is DOE's national leader in the research development and testing of plutonium disposition by immobilization. Lee MacLean, deputy program leader in the Proliferation Prevention and Arms Control Program and program manager for LLNL's Office of Fissile Material Disposition activities, said the lab's work will determine whether the saltwasher technology can be used as part of a national effort to treat and immobilize 13 metric tons of plutonium at a special facility to be built near Savannah.

Once treated, the plutonium would be immobilized in a ceramic matrix in discs roughly the size and shape of a hockey puck. Twenty such disks, each containing about 50 grams of plutonium, would then be sealed in cans, placed in a canister, and immobilized through vitrification. The canisters of immobilized waste will eventually be shipped to a national high-level waste repository, possibly Yucca Mountain.

Contact Mark Bronson, LLNL, 925-422-3061 or bronson1@llnl.gov or Karen Dodson, LLNL, 925-422-1470

New Argonne technologies recover plastics for, from auto industry

Researchers in the Industrial Technology Development Division at Argonne National Laboratory have developed a unique "froth flotation" process that separates individual high-purity plastics from waste streams containing a mixture of plastics. The technology separates equal-density plastics, such as acrylonitrile-butadiene-styrene (ABS), high-impact polystyrene (HIPS), and polypropylene (PP), from each other and from other plastics during scrap shredding and metal recovery operations.

A 100-percent recycled thermoplastic made using Argonne's froth flotation process has been successfully used to produce a "backcan" for an automobile headlamp. Despite the complicated shape of the component, the results of the injection molding test were very successful.

Argonne's froth flotation technology has already been used to recover selected plastics from obsolete appliances, auto shredder residue, disassembled car parts, industrial scrap plastics, and consumer electronics. The economics for recovering and recycling plastics, such as for recovered ABS, are typically very attractive, with a payback of approximately two years. For example, clean and recycled ABS sells for 30-45 cents per pound, compared with virgin material at $1 per pound.

A related process developed at Argonne separates flexible polyurethane foam (FPUF) from automobile shredder residue (ASR) and cleans it to produce high-quality foam that can be used to make new products. The automobile shredder industry

Argonne researcher Scott Lockwood is shown with high-purity plastic recovered using Argonne's patented froth flotation process. The process is the first to produce acrylonitrile-butadiene-styrene (ABS) with a purity greater than 98 percent.

recovers over 10 million tons of ferrous (iron-containing) scrap annually from obsolete automobiles and sells the metals at a significant profit. After metals recovery though, the auto recyclers are left with about 5 million tons of nonmetallic ASR to dispose of annually. The FPUF, which makes up over 30 percent of the ASR volume, is contaminated with automotive fluids, iron oxide, glass, polychlorinated biphenyls (PCBs), and metals. Argonne's efficient, economical process separates and cleans the foam so that it can be recycled. Widespread use of this process would create another value-added product for the shredder recycling industry while reducing landfill waste.

Argonne's pilot-scale FPUF cleaning and drying unit produced more than three tons of clean, dry foam that met all the specifications of major foam recyclers. The material can be used for carpet padding and in automotive applications. The Argonne process was recently licensed to a recovery company Salyp N.V. in Belgium.

Contact Shari Zussman, Argonne National Laboratory, 630-252-5936 or zussman@anl.gov

Berkeley program identifies three overlooked ways to make Cool $ense

While running the U.S. Department of Energy's (DOE) Lawrence Berkeley National Laboratory's Cool $ense Integrated Chiller Retrofit program, energy consultant Lisa Gartland tracked down 15 case studies intended to demonstrate the benefits of integrating load reduction measures and cooling system improvements, according to September's *Construction Specifier*. Gartland's study revealed that building owners and managers frequently overlook three retrofit measures with significant potential for energy savings: daylighting, cool roofing and equipment downsizing.

Most of the buildings Gartland studied were retrofitted with highly efficient fluorescent lamps using electronic ballasts, and in many of them occupancy sensors were also installed to automatically control lights. But only one building—San Francisco's Phillip Burton Federal Building—added daylighting controls. During a test period from June to December 1998, occupancy sensors alone saved 20 to 26 percent of lighting energy. Adding daylighting sensors saved another 27 percent, for a combined savings of 46 percent.

None of the 15 buildings studied were retrofitted with a high-reflectivity, high-emissivity "cool" roof, and worse, none of the designers or managers responsible for these retrofits recognized any connection between their roof and their cooling bills. Equipment downsizing was also overlooked. The average capacity of the old chillers was 260 tons per 100,000 square feet, and the replacement chiller average capacity was 245 tons—a minimal decrease considering these buildings could have easily downsized their chiller capacity by 20 percent or more.

Contact Dr. Lisa Gartland, PositivEnergy, 510-595-PNRG or lisa@pstvnrg.com

ORNL helps build energy efficient Habitat for Humanity homes

A couple of unique houses that went up this year in the Liberty Heights section of Lenoir City, Tenn. were designed and built to serve two purposes.

"The first is to help answer important energy performance questions on innovative buildings technologies," said Jeff Christian, director of the Buildings Technology Center of the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL). "The second is to provide energy efficient Habitat for Humanity housing to eligible homeowners."

The homes contain an insulating concrete form wall system that utilizes light, insulating expanded polystyrene foam blocks stacked inside the walls and filled with concrete. These homes will help scientists and engineers determine how the insulating concrete/foam affects building thermal mass, air-tightness, ground coupling and energy performance.

Hank Pfeiffer of Reward Wall Systems demonstrates a cutaway of the insulating concrete form wall system, expanded polystyrene foam blocks filled with concrete.

More than 100 types of walls were tested and analyzed during a four-year energy efficiency study at the Buildings Technology Center. Construction on the two homes began in January, utilizing Habitat volunteers and current and retired ORNL employees. The homes will be monitored for a period of one year for their energy efficiency.

The project is a partnership between DOE, ORNL, Habitat for Humanity of Loudon County, Tenn., Reward Wall Systems of Omaha, Neb., and the Insulating Concrete Forms Association. ORNL researchers plan to build 10 more houses, each with different wall construction, in the same subdivision for continued study of the wall systems.

Contact Fred Strohl, ORNL, 865-574-4165 or strohlhf@ornl.gov

SIP-built for energy efficiency

Researchers at the U.S. Department of Energy (DOE) Pacific Northwest National Laboratory (PNNL) have been monitoring the potential energy efficiency of the first manufactured home constructed of structural insulated panels (SIPs), one-piece structural building panels made of a solid core of expanded polystyrene foam sandwiched between oriented strandboard panels. The technology, around for more than 50 years, has been slow to gain popularity in the building industry, but may reduce heating and cooling costs by as much as half. Through DOE's Building America program, PNNL researchers will analyze and report the SIP home's energy efficiency, affordability, and structural integrity.

Go to http://www.pnnl-sips.org/

DOE draws 20-year roadmap

The U.S. Department of Energy (DOE) and the building industry have released a 20-year plan to make the next generation of commercial buildings more energy efficient. The goal is to reduce new commercial building energy use by 20 percent by the year 2010, and by 50 percent by 2020.

Hundreds of building industry professionals from more than 150 organizations provided input to the plan. Documented in *High-Performance Commercial Buildings: A Technology Roadmap*, the plan builds on DOE/industry collaborations to identify and publicize innovative "whole building" approaches that increase the quality and efficiency of commercial buildings.

Go to http://www.eren.doe.gov/buildings/commercial_roadmap/

U.S. Government fulfills commitments to renewables, energy efficiency

Waiting to install alternative power-generation devices at your Federal facility? You'd better hurry or you'll fall behind the 'neighbors.'

The U.S. Department of Energy (DOE) with the American Institute of Architects has selected the winners of a design competition for a 32,000-square-foot "sunwall" to cover the south elevation of the DOE Headquarters building in Washington, D.C. When built, the wall is expected to generate 200 kW of electricity, enough to power approximately 60 homes. The design incorporates photovoltaic (PV) panels with a solar thermal installation for hot water.

According to December's *Sustainable Business Insider*, a 2,800-panel, 100 kW multi-celled thin-film PV system is now installed at the U.S. General Services Administration's Suitland, Maryland Federal Center. Through the Million Solar Roofs initiative, over 100,000 solar roofs have been installed since 1997—nearly double the goal of 51,000 solar roofs by 2000. The Federal government also exceeded the goal set forth in President Clinton's Executive Order 13123, which requires 2,000 solar energy systems be installed on Federal buildings by the end of 2000. Over 2,000 Federal systems are operational now, and the government plans to meet its goal of 20,000 PV system installations by 2010.

In early 2002, the U.S. EPA's Environmental Science Center, the government's principal environmental laboratory at Fort Meade, Maryland will be powered by the most efficient on-site power plant in the world, a fuel cell-gas turbine hybrid power system. Says DOE Secretary Richardson, "The Fort Meade project will preview a future of 'good neighbor' power generators that can be sited at or near the customer."

The Fort Meade power plant will combine a solid-state fuel cell and a micro-turbine, both powered by natural gas. It will generate 1,000 kilowatts, about half of the 140,000-square foot lab's electricity, at about 60 percent efficiency as opposed to 35 percent efficiency for conventional power plants.

Go to http://www.doe-sunwall.org, http://www.eren.doe.gov/millionroofs/, and http://www.epa.gov/region3/esc/

DP-42 offers new on-site pollution prevention training course to DOE organizations

The Office of Defense Programs (DP-42) is offering a new on-site pollution prevention (P2) training course to organizations of all levels at Department of Energy (DOE) laboratories and production facilities through May 2001. The course is titled *Pollution Prevention for a Sustainable Environment*.

If you are a P2 coordinator or booster at your DOE site and would like help in training others in the essentials of P2—or if you want to encourage and further educate those already involved—this training course can be a valuable resource for you.

For those at your site unfamiliar with P2, the training provides a basic overview, while those who already have some knowledge of the subject will benefit from updates on new information in the field. As part of the course, each participant will receive a training manual, and you as site P2 coordinator will receive a copy of the presenters' slides on CD.

Contact Elizabeth McPherson, McPherson Environmental Resources, Inc, 423-543-5422 or mers@usit.net and John Marchetti, 301-903-5003 or John.Marchetti@ns.doe.gov, and for a course outline, go to http://www.dp.doe.gov/dp45/p2 (click on "Training")

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